Design Guidelines for More Engaging Electronic Books: Insights from a Cooperative Inquiry Study

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ABSTRACT

This paper presents the results of a cooperative inquiry study aimed at developing a prototype of enhanced eBook for leisure reading. Together with a group of 9 to 11 years old children we explored various design ideas and, starting from these ideas, we developed the eBook prototype and elaborated a shortlist of recommendations. The paper aims to extend the research on the design of children's eBooks with a set of six guidelines that are intended to help designers in creating better and more engaging eBooks.

Categories and Subject Descriptors

Human-centered computing ~ Participatory design

Keywords

Child-Computer Interaction; User Experience; reading experience; prototyping; eBook; e-book; leisure reading; reading for pleasure; co-design.

1. INTRODUCTION

It was 1972 when Alan Kay in his paper entitled *"A Personal Computer for Children of All Ages"* [9] envisioned the *Dynabook*, a sort of ancestor of today's electronic books (eBooks) and electronic readers. Part of his vision was that technology might *"provide us with a better 'book', one which is active (like the child) rather than passive"* before stating that *"This new medium will not 'save the world' from disaster. Just as with the book, it brings a new set of horizons and a new set of problems."*

Since then more than 40 years have passed, yet in our – and other researchers' [18] – opinion these horizons and problems have been only partially explored and addressed. As a matter of fact, despite the exponential growth of the eBook market and the familiarity children have with technology, for the time being most eBooks are just a digital transposition of their paper counterpart and we feel that the potential of new reading devices – such as tablet computers – has yet to be fully exploited.

The goal of the work here presented was to design a prototype of a children's eBook that could create a better user experience, specifically an eBook that could result more engaging for young readers. Our focus was on children in the concrete operational stage [15] and on a context of reading for pleasure – or leisure reading (for a definition of *leisure reading* see [1]).

In this paper we will describe how we designed the eBook prototype and we will suggest some design guidelines for Human-Computer Interaction (HCI) researchers and practitioners concerned with the design of eBooks for children.

2. RELATED LITERATURE

Most of the research to date on eBooks for children looked at the utilitarian/educational aspects of electronic reading (eReading) such as text comprehension or emergent literacy – for a synthesis of the studies on the matter see the work of Zucker et al. [21]. Moreover, most of the studies have been merely *summative* – i.e. determining how good an eBook is – with only a minority which have been *formative* in nature – i.e. providing guidance for the design of eBooks. Among these studies, is the one from Wilson et al. [20] who developed a set of design guidelines obtained through a "series of evaluations conducted on a variety of eBooks". Those guidelines have a fairly strong empirical support, yet they have been proposed more than 10 years ago and – in line with the main trend in HCI research at the time – they are merely focused on preventing usability problems rather than on creating a better user experience. In addition, these guidelines are targeted to an adult population and they have not been created with children in mind.

Guidelines specifically for children's eBooks can be found in the work of Shamir and Korat (as cited in [16]) who elaborated a shortlist of high level design features for educational eBooks: *"(a) oral reading with text highlights that illuminate the nature of print; (b) hotspot activation aligned with text; (c) a dictionary option that allows repeated action by the child; and (d) a game mode separate from text mode"* These guidelines are somewhat interesting and can be a source of inspiration for our study, however they are specifically developed for educational eBooks and aimed at supporting children's emergent literacy. Instead our study pays more attention to leisure eBooks and on how to support readers' engagement.

To our knowledge there is little research in this area. In fact, the review of the literature showed that previous research mainly focused on the usability of eBooks for adults and/or on the utilitarian/educational aspects of children's eReading, while generally little attention has been paid to leisure reading. By focusing on this specific context and on the user, our work aims at filling the gap in the HCI literature on leisure reading and at extending the research on the design of children's eBooks.

3. COOPERATIVE INQUIRY

Research already showed the benefits of including children in the design process [14], therefore our assumption is that we can design better eBooks by actively involving children as design partners. What differentiates the various participatory design approaches – besides the different philosophies behind them – is the degree of user involvement throughout the design process. According to Nesset and Large [14] *Cooperative Inquiry (CI)* is the method which entails the higher degree of involvement, and this is the main reason why we decided to use it. CI is a combination of techniques from different design methods, and it is *"grounded in HCI research and theories of cooperative design involving a multi-disciplinary partnership with children, field research, and iterative low and high-tech prototyping"* [14].

3.1 Participants

CI advocates a design partnership in which adults and children are equal stakeholders in the design process [6]. Therefore we built an intergenerational design team composed by 10 children (7 females and 3 males in the 9 to 11 age range), 3 HCI researchers – i.e. the authors of this paper (who led the design sessions) – and 2 librarians (who helped in the role of facilitators and also provided logistic support).

Children were volunteered from a population of regular users of a children's library. We provided each child with a tablet to keep for the entire length of the partnership, this in order to let them use the device at home, become more familiar with it and have an experience with eBooks in various formats.

3.2 Materials

When we started the project we had to choose for which platform/eReader the eBook prototype should have been developed. Even though it is not an eBook reader in the strictest sense, we chose to use a tablet computer – i.e. iPad® – to have more freedom both for what concerns the format of the eBook and the features it could implement – traditional eBook readers have more restrictions in this sense. IPads® were also introduced in the late stage of the prototyping workflow, and used in combination with a presentation software – i.e. Keynote® – as prototyping tools.

3.3 Setting

During the three months of the study the design team met once a week for one hour and a half. The meetings took place in a children's library in Lugano (Switzerland). We chose this location in order to work in an informal environment that was, at the same time, a location familiar to the participants.

3.4 Approach

In the first meeting we welcomed children, explained them the purpose of the study, gave to each of them a tablet, and answered all their questions. In the second meeting – after children spent one week to read various eBooks in different formats – we did a brainstorming to elicit "likes and dislikes" of current eBooks and to propose new ideas on how to improve them (see *sticky note critiquing* [19]).

In the following phase the design team was divided into 2 groups and each of them worked to develop a paper mockup of an eBook based on the ideas emerged in the previous phase – but children were free to introduce new ideas. After some design sessions, once the paper mockups reached a satisfactory level, the two groups worked to translate the paper mockups into interactive prototypes. We alternated paper prototyping and tablet prototyping sessions – for more details and a discussion on the advantages and disadvantages of each approach see [3]. Children were trained on how to use the Keynote® app and then, together with the adult designers, they worked to realize slideshows that mimicked a real eBook on the iPad®.

To further refine and elaborate the design ideas emerged in the previous stages, the paper mockups were disassembled and each group used the various resulting parts to create new prototypes (see *mixing ideas* technique [19]). The so obtained prototypes informed the final phase of design, where the two groups worked to add the new design ideas in the interactive prototypes previously realized.

3.5 Outcomes

The result of the cooperative inquiry study we just described was a set of increasingly elaborated eBook prototypes. Taking inspiration from the ideas reflected in the prototypes, the authors developed a *beta* – i.e. feature complete – version of an *enhanced* eBook based on *"The Little Prince"* novel. The eBook has been realized using a specific eBook authoring application (i.e. iBooks Author) and existing guidelines on hypertext usability for children [4], eBook production [20], children's interaction with mobile devices [11] and device-specific interaction [8] were taken into account.

In the next section we will discuss the six guidelines we derived from the most salient ideas emerged during the Cooperative Inquiry study. For each of the guidelines we will describe how they have been implemented in the final prototype and the rationale behind them.

4. DESIGN GUIDELINES FOR MORE ENGAGING EBOOKS

The design guidelines presented in this section have been derived from the ideas that – according to the intergenerational design team – would be more effective in enabling a more engaging reading experience. These guidelines do not aim at being prescriptive. Less ambitiously we see them as a source of inspiration for researchers and practitioners for the future design of children's electronic books for leisure reading. For this reason we voluntarily left them quite general in their scope.

I. "It (i.e. the eBook) should not be 'boring'": use audiovisual enrichments to allow for different reading paths

Not surprisingly children wanted to have an eBook that is not "boring", and to this end the design team suggested: (a) videos that summarize parts of the text and (b) sound effects linked with words and images. Videos would allow for a non-linear multi-path reading experience – e.g. children could skip some parts of the text or they could recall what they just read – while sound effects can be used by readers both as a diversion from the reading activity or, in alternative, as a support for their imagination [7]. On the whole the idea is that audiovisual elements should be used to supplement and enhance rather than replace text [20] – i.e. to add redundancy to the textual information – thus allowing for different modes of fruition.

II. "It should have a touch of 'Pathos': provide read-aloud narration of the text

Most children have been accustomed to read-aloud narration since a very young age (with parents reading bedtime stories to them) and it seems that its appeal does not cease when children grow older. In fact our young design partners – who were primary school pupils – included this feature in the eBook prototypes they developed.

Reading aloud is nothing new, and audiobooks have been around for years now – long before tablets and eReaders – but technology is contributing to a *digital renaissance* of read-aloud narration [7]. Electronic books allow for more control over the narration playback and for a synchronized combination of visual reading with audio reading. This creates a multi-modal reading experience that, in turn, may result in an intensification of narrative transportation [7] (see also the concept of *flow* in reading [12]). Moreover, previous research showed that the provision of narration may increase text comprehension [5, 21] and according to Verhallen & Bus (as cited in [17]) *"the temporal contiguity of audio (narration, music) with visual information (illustrations) appears to draw children's visual attention to pictures and print in ways that concretize the text, making it more real for them and more memorable"*.

III. "It should be playful": use interactivity to add value to the eBook and make it more playful.

Wilson et al. [20] argued that *"interactivity can increase a reader's sense of engagement with the book and enhance the material's likeability*". In line with this, the design team suggested to transform the various illustrations in objects one can interact with so that the reading experience can become more lively and playful. Therefore we included features such as coloring pages (see Figure 1) and puzzle games (see Figure 2) to the eBook. Children stressed that interactive enhancements should not be implemented just for the sake of interactivity – e.g. trivial touch-and-response animations – but they should add some "value" to the story and enhance the reading experience in a playful way – e.g. a puzzle that has to be solved in order to reveal some hidden text. In addition to increasing engagement, meaningful interactive enhancements may also support reading comprehension – whereas incongruent enhancements may hinder it [21].

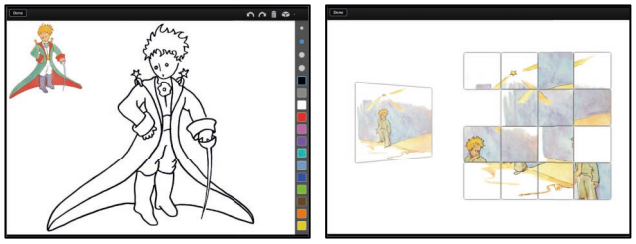


Figure 1 (left): An example of a coloring page: by clicking on an outlined illustration children can paint it; Figure 2 (right): One of the puzzle games we implemented in the enhanced eBook prototype.

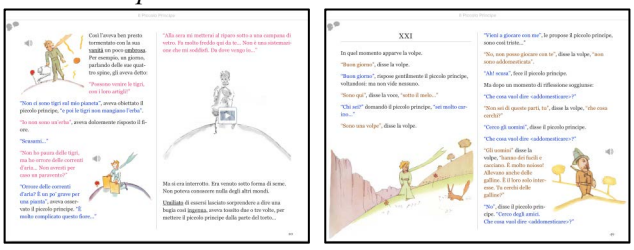
IV. "It should not be too difficult to read": provide in-line dictionary definitions and illustrated descriptive cards

In our view text must withstand as the core of the eBook (see Guideline VI) and many children emphasized the importance of having an eBook that is easy to read (in terms of text comprehension). Writing is (obviously) a writers' duty, yet interaction designers can give their contribution: text can be made interactive with in-line dictionary definitions (see Figure 3) or illustrated descriptive cards (see Figure 4).

Figure 3 (left): An example of an in-line dictionary definition for the word "astronomy"; Figure 4 (right): An example of an illustrated descriptive card for the word "mushroom".

By doing so we enable children to tailor the reading to their skills and this in turn may facilitate *weak readers*' text comprehension or it may allow *strong readers* to expand their reading experience. A good balance between the challenges of a text and a reader's skills is an antecedent of ludic reading [13] and a key condition for *flow* (i.e. intense engagement in a text [12]) to occur. We do not mention here the educational benefits that reading with in-line dictionary entails as they have been already investigated by Korat & Shamir [10].

V. "It should be colorful": use colors to differentiate the various parts in the text



Figures 5 and 6: Few examples of how colors have been used to differentiate the various parts in the text

This might sound as the most trivial and obvious guideline since children's printed books already make an extensive use of colors both for the text and the illustrations. However, surprisingly – in a negative way – colors are seldom used in electronic books and in some cases even illustrations are rendered in black and white. In the *beta* eBook we developed some text was colored to make it more aesthetically appealing (see Figures 5 and 6), but also to facilitate readers in recognizing different part of it – such as direct speeches of different characters. A meaningful use of colors may also help readers to identify patterns in the book, thus simplifying the interaction with the text and enhancing readability.

VI. "It has to remain a book though": use non-textual elements with care and moderation

During a brainstorming session – in one of the early meetings – many children asked us whether some of the highly-interactive eBook applications we provided them could have still been considered "books". They were puzzled because those eBooks had little to do with the concept of "book" they had in mind: interactive, multimedia and/or game-like elements were prevailing over the text and the act of reading was confined to an incidental activity. Therefore the design team's suggested that text must withstand as the core component of an eBook. As we already stressed, non-textual elements should enhance, not replace text: they should not be the only source of engagement, they should rather foster readers' engagement with the text.

5. CONCLUSIONS

In this paper we proposed some recommendations for designing better and more engaging eBooks for children. They were informed by the ideas of an intergenerational design team. Cooperative Inquiry proved to be an effective method for our purposes: the long-term partnership with children co-designers allowed us to explore many ideas and, consequently, to condensate the most salient ones into a set of six guidelines.

In general, some of these guidelines seem to suggest that the eBook should be designed to be flexible enough and to allow children to tailor the reading experience on their persona in order to reach a balance between the challenges of the reading activity and their skills. *Gamification* (i.e. using game design elements in non-game contexts) is another important aspect in a context of leisure reading, but designers should exercise caution when adding features to enhanced eBooks. This because the story told by the text is, or should be, the core of the book and the main source of children's engagement with it: therefore any design solution or enhancement should contribute in this sense.

Our recent work of evaluation [2] seems to indicate the efficacy of our design guidelines, still further research is needed to better understand children's experience with enhanced eBooks (for instance eBooks based on different novels or targeted to a different age-group) or the interplay between the story itself and the various multimedia/interactive elements. Our hope is that these guidelines will inspire researchers and practitioners to create eBooks which are – as Alan Kay wrote – *"active (like the child) rather than passive"* [9].

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7. REFERENCES

[1] Clark, C. and Rumbold, K. 2006. Reading for Pleasure: A Research Overview.

[2] Colombo, L. and Landoni, M. 2014. A Diary Study of Children's User Experience with EBooks Using Flow Theory as Framework. Proceedings of the 13th International Conference on Interaction Design and Children - IDC '14 (New York, New York, USA, 2014).

[3] Colombo, L. and Landoni, M. 2013. Low-tech and high-tech prototyping for eBook co-design with children. Proceedings of the 12th International Conference on Interaction Design and Children - IDC '13 (New York, New York, USA, 2013), 289–292.

[4] Gilutz, S. and Nielsen, J. 2002. Usability of websites for children: 70 design guidelines.

[5] Grimshaw, S., Dungworth, N., McKnight, C. and Morris, A. 2007. Electronic books: children's reading and comprehension. British Journal of Educational Technology. 38, 4 (2007), 583–599.

[6] Guha, M.L., Druin, A. and Fails, J.A. 2012. Cooperative Inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design. International Journal of Child-Computer Interaction. in press (2012).

[7] Have, I. and Stougaard Pedersen, B. 2013. Sonic mediatization of the book: affordances of the audiobook. MedieKultur. Journal of media and communication research. 29, 54 (2013), 123–140.

[8] iOS User Experience guidelines: 2013. https://developer.apple.com/library/ios/documentation/userexperience/conceptual/mobilehig/UEBestPractices/UEBestPractices.html. Accessed: 2013-09-05.

[9] Kay, A.C. 1972. A Personal Computer for Children of All Ages. Proceedings of the ACM annual conference - Volume 1 (New York, NY, USA, 1972).

[10] Korat, O. and Shamir, A. 2008. The educational electronic book as a tool for supporting children's emergent literacy in low versus middle SES groups. Computers & Education. 50, 1 (2008), 110–124.

[11] McKnight, L. and Cassidy, B. 2010. Children's Interaction with Mobile Touch-Screen Devices: Experiences and Guidelines for Design. International Journal of Mobile Human Computer Interaction. 2, 2 (2010), 1–18.

[12] Mcquillan, J. and Conde, G. 1996. The Conditions of Flow in Reading: Two Studies of Optimal Experience. Reading Psychology. 17, 2 (Apr. 1996), 109–135.

[13] Nell, V. 1988. Lost in a Book: The Psychology of Reading for Pleasure. Yale University Press.

[14] Nesset, V. and Large, A. 2004. Children in the information technology design process: A review of theories and their applications. Library & Information Science Research. 26, 2 (2004), 140–161.

[15] Piaget, J. 2007. The Child's Conception Of the World. Rowman & Littlefield, 2007.

[16] Roskos, K., Brueck, J. and Widman, S. 2009. Investigating Analytic Tools for e-Book Design in Early Literacy Learning. Journal of Interactive Online Learning. 8, 3 (2009), 218–240.

[17] Roskos, K., Burstein, K., Shang, Y. and Gray, E. 2014. Young Children's Engagement With E-Books at School: Does Device Matter? SAGE Open. 4, 1 (2014).

[18] Schreurs, K. 2013. Children's E-books are Born: How E-books for Children are Leading E-book Development and Redefining the Reading Experience. Partnership: the Canadian Journal of Library and Information Practice and Research. 8, 2 (2013).

[19] Walsh, G., Foss, E., Yip, J. and Druin, A. 2013. FACIT PD: A Framework for Analysis and Creation of Intergenerational Techniques for Participatory Design. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '13 (New York, New York, USA, 2013), 2893–2902.

[20] Wilson, R., Landoni, M. and Gibb, F. 2002. Guidelines for Designing Electronic Books. Proceedings of the 6th European Conference on Research and Advanced Technology for Digital Libraries – ECDL (2002), 47–60.

[21] Zucker, T.A., Moody, A.K. and McKenna, M.C. 2009. The Effects of Electronic Books on Pre-Kindergarten-to-Grade 5 Students' Literacy and Language Outcomes: A Research Synthesis. Journal of Educational Computing Research. 40, 1 (2009), 47–87.